DRAFT ENVIRONMENTAL ASSESSMENT
FERN RIDGE DAM REPAIR
INTERIM OPERATIONS
LANE COUNTY, OREGON

INTRODUCTION

In July 2002, project personnel reported a depression slightly down slope from the embankment drain alignment on the downstream slope of Fern Ridge Dam, located in Lane County, Oregon, about 6 miles west of the Eugene/Springfield metropolitan area. A video inspection in September 2002 of the drainage laterals (the drain pipes that carry flows from the main line out to the downstream toe) revealed significant deterioration. However, due to the configuration of the system, an inspection of the main embankment drain pipe was not possible. In February 2003, two more depressions were observed on the downstream slope of the dam. Both of these depressions are smaller than the original depression but are also located above the embankment drain alignment. Daily monitoring of the drainage system discharge has shown a change in the flow pattern and turbidity readings from several of the lateral drains. One embankment piezometer is also showing elevated readings and the toe area is wet in two locations, indicating that ground water is at or near the surface. These conditions were noted during the winter and spring, especially during rain events. The observed distress has led to two primary concerns: 1)internal erosion of the embankment dam and, 2) downstream slope instability caused by toe wetness.

The investigation into the nature and extent of the problem should be completed by February 2004. However, the embankment dam currently meets the criteria for a pre-emergency condition (declared in May 2003) and concerns for safety have led to placing a restriction on the reservoir's maximum elevation. As part of the restriction, an interim operating plan has been developed to operate the project safely until the dam can be repaired.

When the additional data have been recovered and analyzed, a plan of repair will be prepared. Should extensive repairs be required, involving excavating the dam face, replacing the drainage system, and reconstructing the dam face (actions which are expected to keep the pool at minimum pool level for one recreation season), additional appropriate environmental documentation for the repair action will then be prepared and issued for agency and public review.

Normal operation of the reservoir was included in the 1980 EIS on Operations and Maintenance of the Willamette Reservoir System. Under normal operation, Fern Ridge is drawn down to minimum flood control pool (elevation 353 feet NGVD) in the Fall, beginning mid-September. By November 15, the pool is down to 353 feet. During the major flood season (Nov. 15-Jan. 31) the pool is allowed to rise to maximum controlled pool (also called maximum flood control pool) of 375.1 feet, and as waters recede, dropped back to 353 feet. Beginning February 1, the pool is allowed to fill up to 373.5 ft., the maximum conservation (or full) pool, assuming sufficient inflow. Conservation pool is normally reached by April 16. In low flow years the pool may not reach this level. In 1987 the conservation pool reached a maximum of 371.2 feet, and in the severe drought year of 2001, the pool did not exceed 365.8 feet.

PURPOSE AND NEED

The purpose of the proposed action is to operate Fern Ridge reservoir in a manner to increase the downstream slope stability to an acceptable level while still providing maximum possible flood control capacity, and maximum possible conservation pool to provide water for irrigators and recreation. This operation regime would be maintained annually until further investigations indicate more favorable conditions exist, an interim measure is constructed to improve downstream slope stability or the dam is permanently repaired.

PROPOSED ACTION AND ALTERNATIVES

After drawdown of the reservoir to minimum pool (elevation 353 feet) in the Fall (normal operation), the proposed action is to operate the reservoir in a manner to reduce the safety concern at Fern Ridge Dam by allowing a maximum elevation of 371 feet (4.1 feet below the normal maximum) during the major flood season (16 November to 31 January) and also at a maximum elevation of 371 feet (2.5 feet below the normal conservation pool maximum) during the conservation seasons (1 February to 15 November). This change in operation will result in the loss of 35,000 acre feet of flood storage capacity (about 30 percent of the normal total capacity), and the loss of 15,000 acre feet of conservation storage (about 15 percent of the total normal storage capacity). These changes could result in higher downstream flows during the flood control season (i.e. water that could have been stored in the reservoir between 371 feet and 375.1 feet will now be passed downstream) and during the late spring filling season (i.e. water that would have been stored in the reservoir between 371 feet and 373.5 feet will also be passed downstream). Operation of the reservoir is subject to weather conditions in any specific year. In an especially dry year (like 2001), even the target elevation of 371 feet for the conservation pool may not be obtainable due to the lack of sufficient inflows.

The interim plan includes a maximum flood control and conservation reservoir elevation of 371 feet and a modified reservoir filling and downstream release schedule. The reservoir restriction is based upon a very conservative analysis of current data. As such it represents a "worst case." The completed investigation may indicate more favorable conditions exist, or an interim measure may be constructed to improve downstream slope stability. Possible interim measures include protecting the dam with a plastic liner, placing a rock "blanket" on the face of the dam, or installing French drains. Any of these developments would allow part or all of the restriction to be lifted and would cause minor disturbance of the dam face during construction. Impacts of operating the pool at higher than elevation 371 feet, if possible, are included in the following analysis.

The proposed action contains some measures to mitigate expected adverse impacts to fish and wildlife. These measures include not growing wildlife crops in the impoundments and keeping them wet for waterfowl, spot treating new areas of reed canarygrass to reduce expansion, and increased monitoring of exposed lakebed to reduce illegal artifact collecting and ORV use.

The alternative of operating the reservoir at other than the 371 foot elevation during the summer has been considered. Slightly different levels could occur, depending on inflow, safety factors, or wildlife needs. Reservoir levels could be raised slightly after May 1 depending on the availability of inflow; however that would adversely affect nesting marsh birds, while possibly improving conditions for other species such as pond turtles. Given the present state of

knowledge, maintaining a stable reservoir level of 371 feet during the summer is considered the most reasonable action, although provision for operating at higher elevations, if possible, is made. The decision to operate above 371 feet will not be made until Feb. 2004 or later.

The no action alternative is not acceptable due to concerns related to downstream slope stability.

AFFECTED ENVIRONMENT

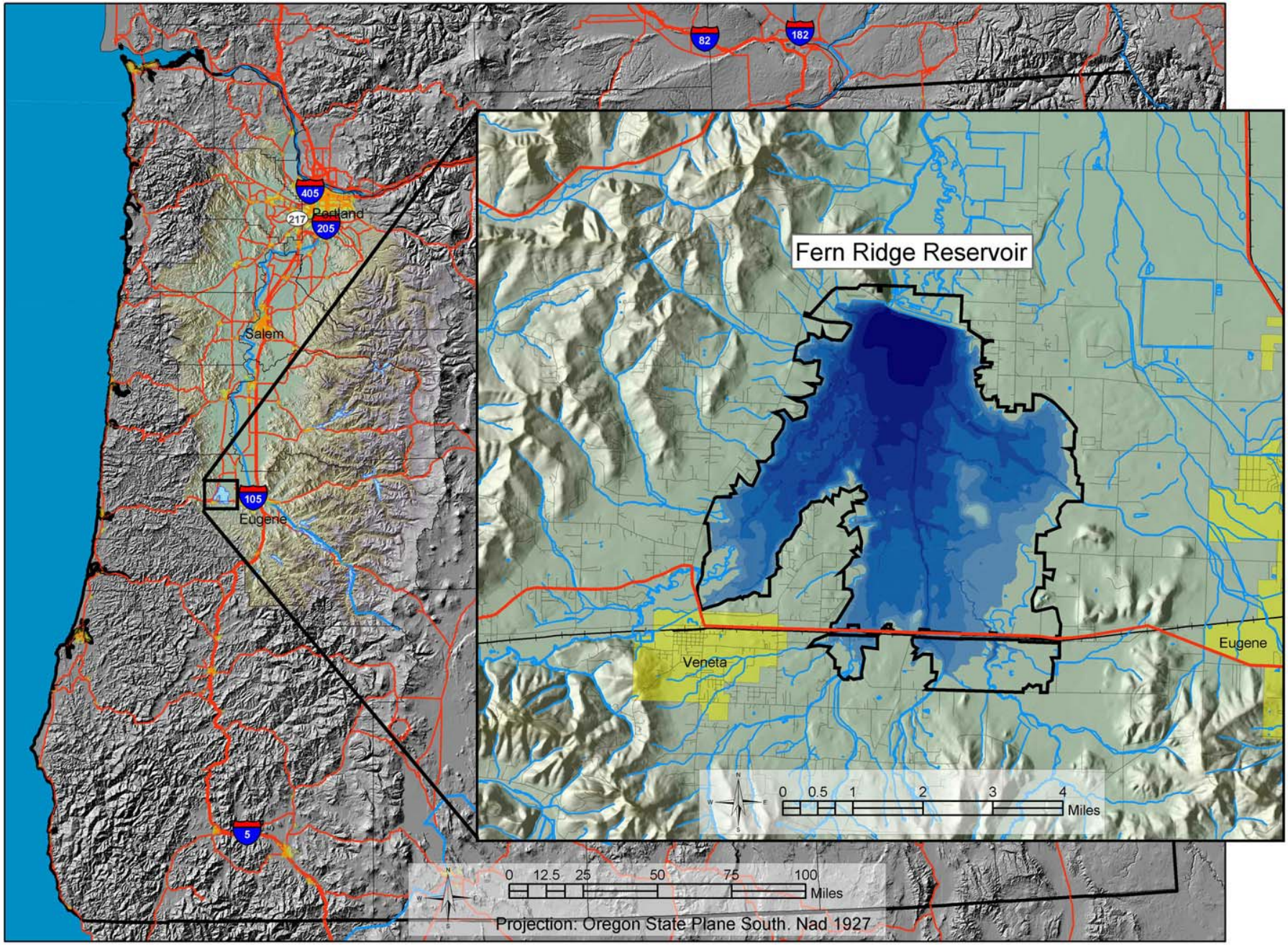
The project area is Fern Ridge Lake, located in Lane County, Oregon, about 6 miles west of the Eugene/Springfield metropolitan area. (Figure 1) Fern Ridge Dam crosses the Long Tom River 23.6 miles above its confluence with the Willamette River, and also impounds tributaries of the Long Tom, including Coyote Creek and Amazon Creek. The authorized project purposes for Fern Ridge include flood control, irrigation and M&I (municipal and industrial) water supply. However, since construction, other uses have evolved such as recreation, fish and wildlife enhancement and water quality. The earthen dam was completed in 1941 and raised 2 feet, from 47 to 49 feet, in 1965 to provide additional flood control storage. Dike No. 2 also was raised 2 feet.

The reservoir provides 110,000 acre-feet of usable flood control storage and controls runoff from a 275 square-mile drainage area. The main dam consists of an earthfill embankment dam, a concrete gravity spillway near the left abutment, a non-overflow structure 46 feet long containing outlet works, and an overflow structure 248 feet long controlled by six Radial (tainter) gates. Two auxiliary dikes close off low areas along the northeast shore of the lake. The project also includes channel improvement on the Long Tom River downstream from the dam to the Willamette River.

At maximum conservation pool, Fern Ridge Lake has about 8,933 acres of water surface. It has become extremely popular with swimmers, boaters, and other users, even though recreation was not originally an authorized primary project purpose. Fern Ridge is used heavily for picnicking, swimming, sailing, water skiing, and fishing. The Corps operates Kirk Park and a number of minimally developed access points to Project lands around the lake. Richardson, Orchard Point, Perkins Peninsula and Zumwalt parks are managed by the Lane County Parks Department under lease agreements. Fern Ridge Shores is a private park that provides day-use and primarily resident camping facilities and seasonal boat moorage. The number of recreation visitors to Fern Ridge has varied over the last few years. During the severe drought year of 2001 visitation was about 369,000 whereas in 1999 there were over 789,000 visitors to Fern Ridge.

The Oregon Department of Fish and Wildlife (ODFW) conducts management activities on 5,000 acres of land and water for migratory waterfowl under a license agreement. A special continuing authority contained in Section 1135 of the Water Resources Development Act of 1986, as amended, allows modifications to structures and operations of constructed Corps projects to improve the quality of the environment. At Fern Ridge, the Fisher Butte waterfowl impoundments were initiated in July 1993. The three impoundments restored 115 acres of project lands on the east shore of Fern Ridge Lake to a more natural condition for waterfowl management. Construction included levees, ditches and overflow spill-ways, as well as installation of an irrigation water supply pump, a water supply pipeline, and drainage culverts with flashboard risers. The non-Federal sponsor is the ODFW. The more recent Fern Ridge

Figure 1: Fern Ridge Location Map



Marsh Restoration Project entails marsh restoration and management actions on 347 acres in the western portion of the Fisher Butte Management Unit (West Fisher Butte sub-unit) at Fern Ridge Lake Project. The general intent of the 1135 action is the restoration of a more diverse and productive marsh plant and wildlife community in areas currently dominated by reed canarygrass, a non-native plant.

A general description of Fern Ridge Lake and reservoir operation is available in the referenced 1980 EIS. Detailed description of the Lake and the Wildlife Management Units can be found in Fern Ridge Lake, Part 2A of the Upper Willamette Valley Projects Master Plan for Resource Use, May 1988 (USACE 1988).

Physical Environment

Fern Ridge Lake is a wide, shallow, multi-purpose reservoir. It is irregularly shaped, with a large peninsula on the south shoreline between the two major tributaries, Long Tom River and Coyote Creek. At maximum conservation pool (373.5 feet NGVD) the lake is 5.5 miles long, 5 miles wide, has a shoreline length of about 32 miles and surface area of about 8,933 acres. At minimum pool (353 feet) the lake has about 1,500 surface acres (USACE 1988). At maximum conservation pool, the lake is about 25 feet deep at its deepest point, and has an average depth of about 7 feet. At maximum controlled (flood control) pool (elev. 375.1 feet), the lake has about 10,340 surface acres. This is the maximum for flood storage.

Fern Ridge Lake Project contains 12,780 acres either owned in fee by the Federal Government or for which flowage or other easement rights have been acquired. Fee owned lands total 11,810 acres. Downstream of the dam, flowage easements for channel improvements were acquired along the Long Tom River on 776 acres. Highway 126 (West 11th Avenue) crosses the south end of the project, providing direct access from Springfield and Eugene (Ibid.).

Fern Ridge area topography is very flat and composed primarily of alluvial deposits. Many of the soils are subject to severe erosion and characterized by high seasonal water table. Typically, summers are warm and dry, while winters are mild and wet. Average annual precipitation for Eugene is 46 inches. Above the dam, it is about 55 inches, with about 70 percent falling between October and February. Less than 3 percent falls during July and August. Runoff follows a similar pattern, with high winter flows and low summer flows.

Water quality and quantity has distinct summer and winter conditions. Water in the project area is strongly affected by reservoir operation, which keeps water levels high in the summer with little fluctuation and low, with large fluctuations, in the winter months. Backwater portions of Amazon channel and Coyote Creek have yielded high coliform counts. Turbidity increases in summer as recreational activities in the lake disturb clay sediments and as algae growth increases. The high population of carp, an introduced bottom-feeding fish, also contributes to suspended sediments that may impact lake turbidity. High phosphorus and moderate nitrogen loads are contributed to the lake from the watershed via tributaries. Rooted wetland plants utilize some of these nutrients, helping to keep them out of the lake. Water quality declines in the winter, reflecting winter storm runoff. Suspended sediments, bacteria and nutrients are significantly higher in the winter (USACE 1988).

Fern Ridge Lake. The Corps and ODFW have collaborated in constructing and operating 900 acres of wetland impoundments to provide habitat for wildlife, with an emphasis on attracting and holding wintering waterfowl. In past years, this was accomplished by draining the impoundments in the spring and planting cereal grains; most acreage is now managed to maintain year-round wetland habitat through moist soil management, which provides waterfowl with seed from native plants while also providing quality wetlands for the myriad species that use them. Moist soil management techniques employ a combination of water level control, periodic soil disturbance, and timed draw down and inundation to foster growth of native wetland species. These seasonally wet or semi-permanent marshes provide a productive habitat base to support wildlife diversity. Completed in 2000, the most recent additions (Fisher Butte Field #5 and #6) added 320 acres of wetland habitat to the project. These impoundments were constructed within the lake in an extensive reed canarygrass marsh; current efforts focus on disking, water level control and other treatments to reduce canarygrass and promote native vegetation in the wetland. Water level control is integral to moist soil management within the impoundments, and is achieved primarily through pumping and a system of control structures. Approximately 50-100 acres of grain crops (corn, soybeans, rice) are planted each year in the Fisher Butte and Coyote Units; these crops require irrigation to produce seed for waterfowl.

Lower Long Tom River. The Long Tom River flows 23.6 miles from Fern Ridge dam to its confluence with the Willamette River. The lower river flows through flat fluvial deposits; the Willamette River prior to construction of the upstream Willamette dams routinely flooded the entire valley. The lower Long Tom River has been highly modified; almost the entire river (61 river miles) was channelized by 1947 to reduce flooding and facilitate agricultural use. The Long Tom Watershed Assessment (Thieman, 2000) lists 4 impoundments, 8 check dams and 24 miles of levee on the lower river. Main agricultural crops in the watershed are grass seed, hay, mint and specialty seeds (Ibid.). Major tributaries are Bear and Ferguson Creeks.
Major flood stage, corresponding to a flow of 7,000 cfs peak at Monroe, is estimated to have a "probablility of being equaled or exceeded in any one year" of about 75 percent (prior to construction of Fern Ridge dam ~1930's). Under *current* flood regulation operations, the probability is reduced to as low as about 30 percent annually.

Summer flows in the Lower Long Tom River are augmented by stored water. Prior to construction of the dam, average daily flows in August were 24 cfs compared to a post-construction flow average of 81 cfs (USACE, 2000). The lowest flow recorded at the Alvadore Station just below Fern Ridge dam prior to construction of the dam was 7 cfs (Oct. 1939). The ODFW has established flow targets of 50 cfs (Dec.-June), and 30 cfs (July-Nov.) at Monroe to maintain fish life. The Corps attempts and usually succeeds in meeting these targets while supplying irrigation water between the dam and Monroe.

Permits for use of surface water on the Long Tom River issued by Oregon Water Resources Department (OWRD) total 331 cfs. Actual use is lower at any one time; however, there is not sufficient surface water to supply permitted uses in August. Fern Ridge reservoir stores and releases water for irrigation that is contracted through the Bureau of Reclamation; contracts currently exist for 25,178 acre-feet (USFWS 2003).

Despite flow augmentation, DEQ and watershed council monitoring indicate impaired water quality on the Long Tom with respect to water temperature, phosphorous, turbidity and dissolved

solids, potential problems with bacteria and pH, and the presence of several pesticides (Thieman, 2000). Residence time in the lake contributes to high water temperatures in the lower river, which exceed the lethal temperature for juvenile salmonid rearing in the summer (USFWS 2003).

A biological assessment conducted in the late 1990s noted loss of habitat complexity in the lower river since dam construction, resulting from loss or reduction in side channel habitat, large woody debris, and sediment supply. Bank protection and agriculture have resulted in extensive loss of riparian habitat in the Lower Long Tom basin. (USACE 2000).

The Long Tom Area of Critical Environmental Concern (ACEC) occurs adjacent to the east bank of the lower Long Tom River approximately 2 miles below Fern Ridge dam, and is managed by Eugene District BLM. Besides supporting Federally-listed Endangered Bradshaw's lomatium (*Lomatium bradshawii*), two other rare species endemic to prairie habitats, shaggy horkelia (*Horkelia congesta*) and timwort (*Cicendia quadrangularis*), occur at the site.

Lower Coyote Creek. Lower Coyote Creek flows north from Kirk Pond through an outlet designed to maintain the pond at a constant elevation. The pond is supplied with water from the reservoir through a pipe in the spillway works and normally supplies 7-8 cfs during April–Sept. when Fern Ridge is full. In the summer, lower Coyote Creek typically runs dry before it reaches its confluence with the Long Tom River. Water withdrawals and diversions on the Lower Coyote are few but sufficient to diminish surface flows by August in a typical year. Lower Coyote Creek runs through a significant parcel of bottomland hardwood forest, and floods an area of unknown size during winter. The creek provides valuable habitat for a variety of native species associated with riparian forests, including songbirds, small mammals, reptiles and amphibians.

Biological Environment

Fern Ridge Lake supports over 2,500 acres of emergent wetland marsh that includes cattail, bulrush, and rush species, but is dominated by reed canarygrass, an exotic invasive grass that has supplanted native plants to form vast monoculture marsh beds at Fern Ridge. Reed canarygrass replaces native vegetation, alters ecosystem functions, and can provide habitat for other exotic species (e.g., spawning habitat for exotic warm-water fish). It provides cover and nesting habitat for some wildlife (e.g., American bittern), but in general provides little in the way of nesting and feeding habitat for most northwest species.

Waterfowl. Fern Ridge provides extensive wintering habitat for ducks, geese, and other species including tundra swans and great egrets. Duck species wintering on the project include large numbers of mallard, green-winged teal, shoveler, wigeon and pintail, and lesser numbers of gadwall, scaup, ring-necked duck, bufflehead, wood duck, merganser, canvasback, redhead, and goldeneye. Goose species include large numbers of cackling and western, and fewer dusky Canada geese (ODFW, unpubl. data). Hundreds of tundra swans spend part of the winter roosting in the lakebed.

Although primarily important as wintering habitat, the near- shore uplands, and lakebed and impoundment marshes at Fern Ridge also provide breeding habitat for Canada goose, wood duck, mallard, cinnamon teal, and occasionally ruddy duck and blue-winged teal. Breeding redhead ducks have become more common in recent years.

Marsh Breeding Birds. Marsh species breeding at Fern Ridge include pied-billed grebe, western grebe, Clarks grebe, American bittern, Virginia rail, sora, American coot, black tern and, recently, black-necked stilt, Wilson's snipe and Wilson's phalarope.

An estimated 25 pair of black terns breed at Fern Ridge lake, and are often observed along the southeastern part of the lake in the Fisher Butte unit, and also in the East Coyote wetland impoundments. Black terns nest in loose colonies on floating platforms constructed of marsh vegetation; at Fern Ridge these are most likely to be constructed of hardstem bulrush (*Scirpus acutus*), but may also occur in cattail, sedge or rush species present in the marsh.
Black terns arrive at Fern Ridge in early May, somewhat later than other marsh nesting species. At Sycan marsh in eastern Oregon, where birds also arrive the first week of May, nest initiation does not commence until the third week in May. In northern latitudes, most clutches are initiated the third week of May through the first week of June (USFWS 1999). In the breeding season, terns eat both aquatic and terrestrial insects, but may also take small fish and mollusks.

Shorebirds. Fern Ridge Lake provides essential habitat for many species of shorebirds during spring and fall migration, in the winter, and through the breeding season. Although it does not typically hold large concentrations of shorebirds, the freshwater habitat is important for several species that don't typically occur in large flocks, such as solitary sandpiper and spotted sandpiper, and for smaller numbers of species such as Western sandpiper. During certain times of year thousands of shorebirds can be found at Fern Ridge, including wintering dunlin flocks numbering up to 20,000 birds. Fern Ridge was designated an Important Bird Area by the National Audubon Society partly because of the shorebird habitat it provides.

Eleven species of shorebirds are found in good numbers at Fern Ridge Lake in the appropriate season: black-bellied plover, semipalmated plover, killdeer, greater yellowlegs, lesser yellowlegs, spotted sandpiper, Western sandpiper, least sandpiper, dunlin, long-billed dowitcher, and Wilson's snipe. Six more regularly occurring species found in low numbers include black-necked stilt, solitary sandpiper, Baird's sandpiper, pectoral sandpiper, Wilson's phalarope, and red-necked phalarope. An additional 14 species of rare or accidental shorebirds have been found there: American golden-plover, snowy plover, American avocet, willet, whimbrel, long-billed curlew, marbled godwit, sanderling, semipalmated sandpiper, sharp-tailed sandpiper, stilt sandpiper, ruff, short-billed dowitcher, and red phalarope.

As lake levels change throughout the year, shorebirds use different areas of the reservoir. During winter, the extensive mudflats created at low pool provide habitat for several species, including killdeer, long-billed dowitcher, least sandpiper, and tens of thousands of dunlin. Wilson's snipe use the muddy areas with some vegetation. Smaller numbers of greater yellowlegs, black-bellied plover, and Western sandpiper are present through the winter months. In spring, migrating shorebirds begin to arrive in late March, congregating around the edges of the lake and in any available muddy or wet spot, including marshy areas in the Fisher Unit and Coyote Unit and in wet fields adjacent to the reservoir. Spring migrants have moved on north by early June. Several species remain to breed, including killdeer, black-necked stilt, Wilson's snipe, and Wilson's phalarope. Fall migration is more apparent at the reservoir than in spring, when southbound shorebirds seek places to rest and feed. Receding water levels in late July, August, September, and early October provide constant fresh habitat as new mudflats surface, mostly around the southern and eastern edges of the lake. Usually the water level doesn't start dropping quickly

until September, so shorebird habitat is somewhat limited until then. Recently, the shoreline near Gibson Island, the area adjacent to Highway 126 east of Perkins Peninsula, and the wet areas in the Fern Ridge Wildlife Area have had the most shorebirds during fall. When conditions are right, such as when a cell in the Fisher Unit is lowered or when a large flat area of the reservoir is suddenly exposed, congregations of hundreds of shorebirds can be seen until the habitat goes dry. As fall migration tapers off in October, shorebird diversity subsides and the wintering species return. Peregrine and merlin falcons take advantage of the shorebird migration and are frequently seen hunting the mudflats in September and October.

Other Birds. In Oregon, purple martins nest in snags and crevices, and increasingly in nest boxes and gourds put up for their use. Described as common in the southern Willamette Valley in the 1940s, their populations are thought to have undergone a dramatic decrease since that time, due to loss of snag habitat and increasing competition from starlings, although this decline was poorly documented (ODFW, 1991). Efforts to provide nesting habitat have resulted in establishment and growth of several colonies in western Oregon in recent years.

Fern Ridge enjoys a large purple martin breeding population that has been monitored annually for size and productivity since 1998. Boxes originally placed in the 1970s were supplemented by Corps and ODFW efforts in 1997-2000 that resulted in more than 260 boxes available to martins in 2000. The martin population grew every year between 1998 and 2000, apparently in response to increased availability of nest structures. In 2000, 124 breeding pairs were counted. The population breeding at Fern Ridge has been grouped into nine colonies. Banding was conducted in 2003 to gather information on interchange between these groups. Most colonies consist of 1-4 gangs of four boxes mounted on several poles or old oak snags in the lakebed. Poles with boxes are surrounded by water in a normal year. Nest boxes placed on poles in the lake are less likely than nest boxes on land to contain nests of starlings and tree swallows. In 2000, Fern Ridge supported an estimated 10 percent of Oregon's purple martin population (Corps, K. Beal, pers. comm.).

Martins return to Fern Ridge in late March or early April. Nest building begins in May, and young fledge in July and early August. Martins feed on flying insects, including beetles, butterflies and dragonflies (Marshall, et al., 2003).

Western Pond Turtle. Fern Ridge Lake project supports a relatively large and significant Western pond turtle population. Turtles are concentrated in the southern and western sectors of Fern Ridge Lake, and are associated with the extensive emergent wetlands that occur along the old Long Tom channel, and more recently are found in the Fisher Butte wetland impoundments. A second large population occurs in Kirk Pond below the dam.

Estimated in the low 300's in 1993, the lake's population has been supplemented by the release of 187 head-started turtles between 1995 and 2001. Current population size is unknown. Nesting has declined drastically at two formerly busy nest sites, for unknown reasons.

The Western pond turtle population in Kirk Pond was estimated at 40 turtles in 1993 using mark-recapture techniques (unpubl. data, USACE). In 2000, the study was repeated and yielded an estimate of 100 turtles (unpubl. data, USACE). This is a relatively large and therefore important population; especially since age structure indicates successful recruitment of juveniles into the population, a rare finding in the Willamette Valley. Radio-telemetry studies indicate that Kirk

Pond turtles also use Lower Coyote Creek, downstream of the pond. The Corps manages two active turtle nesting areas that produce 10–20 nests annually.

Red-legged Frog. Fern Ridge Lake supports a large and significant red-legged frog breeding site, perhaps one of the largest remaining on the floor of the Willamette Valley.

The Frog Pond breeding site consists of two ponds, Main Marsh, approximately 24 acres with an average depth of 1.3 ft and an approximate elevation of 370'–372' NGVD, and Half Moon Pond, a 1-acre pond with an average depth of 2.6 ft and an approximate elevation of 371 feet NGVD. Both collect surface water during the winter when red-legged frogs breed. The lake inundates both sites when it fills in mid-late April, long after egg deposition is concluded. Red-legged frog egg masses are attached to reed canarygrass, *Vallesnaria, Ludwigia* and *Polygonum* species, wetland emergent plants that thrive in shallow water. Chris Pearl (USGS) has monitored this site since 1996. Breeding tends to begin in mid-January. Breeding has dropped off since 1998, and has been steadily declining for unknown reasons. The effects of exotic fish species may be partly responsible (pers. comm., C.Pearl). Metamorphosis commences 4–5 months after hatching (Leonard, et al., 1993); in late May to late June for most frogs at this site. Once metamorphosis occurs, froglets move to nearby riparian terrestrial habitats

The Corps and USGS monitor this site annually; efforts to reduce numbers of over-wintering predaceous fish at the site are planned for 2003.

Fish. Fern Ridge Reservoir supports naturally reproducing populations of introduced bluegill, black crappie, brown bullhead, common carp, largemouth bass, mosquitofish, pumpkinseed, warmouth, white crappie and yellow bullhead. Native fish inhabiting the reservoir include: cutthroat trout, largescale sucker, sculpin, northern pikeminnow, and redside shiner. Oregon Department of Fish and Wildlife has monitored the fish population in Fern Ridge Reservoir using a combination of creel, electrofishing, and trap netting. To evaluate the current status of fish populations inhabiting the reservoir, fish biologists from the Corp of Engineers deployed trap nets from August 6-8, 2003 in two locations previously monitored by ODFW from July 22-24, 1997. Species composition was found to be similar (Table 1).

Cutthroat trout presence and habitat use. Although trap net surveys identified no cutthroat trout, ODFW has designated Willamette River cutthroat trout as a "stock of concern". Cutthroat trout inhabiting the Willamette River Basin and tributaries upstream of Willamette Falls exhibit resident, fluvial, and adfluvial life history patterns. They are the only native trout present in Coast Range tributaries to the Willamette such as the Long Tom. The Long Tom Basin contains all three life history patterns with resident and fluvial populations inhabiting the Long Tom above and below Fern Ridge Dam. Following construction of Fern Ridge Dam a unique adfluvial cutthroat trout population developed on the upper Long Tom River. The population was historically fluvial prior to dam construction, but now makes spawning runs upstream out of Fern Ridge Reservoir during late summer each year (ODFW 1995). These migrants are large, often greater than 12 inches in length, and retain a silver coloration similar to searun cutthroat trout. Reservoir use and distribution of these fish is poorly understood, however, cutthroat are typically captured in small numbers during reservoir sampling.

Table. 1 Species, number, and size of fish captured in Fern Ridge Reservoir using trap nets at two sites in 1997, 2003.

	Species									
	BC	BG	BRB	COT	CP	CSU	LB	WC	WM	YB
Length										
1-3	2, 0	1, 119	0,15	1, 1	3, 0	1, 2	29, 84	107, 54		0, 10
4-6	1,5	2, 23	2,119	1, 1			1, 13	0,2	1, 4	0, 40
7-9	1,6	2, 0	36,274		0, 8		0,2	10,11		0, 21
10-12			13,9		0, 3	3, 0		6,0		0, 4
13-15			0,3		1, 3	4, 2				0, 1
16-18					2, 3	11, 4				
> 18					0, 2					
Total	4, 11	4, 142	51, 420	2, 2	6, 19	19, 8	30, 99	123, 66	1, 4	0, 76

Data are listed in order 1997, 2003 for comparative purposes

BC = Black Crappie, BG = bluegill, BRB = brown bullhead, COT = sculpin spp., CP = common carp, CSU = largescale sucker, LB = largemouth bass, WC = white crappie, WM = warmouth, YB = yellow bullhead

Fish life in the Long Tom River below the dam is similar to that of the reservoir. Fish species are primarily introduced, warm-water species. Pacific lamprey and cutthroat trout do occur in the river, and juvenile Willamette spring chinook hold up in the mouth of the river during winter.

Threatened and Endangered Species. A list of Federal threatened and endangered species that have occurred or may occur in the project area has been received from the U.S. Fish and Wildlife Service for the Fern Ridge Dam Repair Project. Species include bald eagle, Oregon chub, Willamette spring chinook, Fenders blue butterfly, Kincaid's lupine, Bradshaw's lomatium, Willamette Valley daisy, golden Indian paintbrush and Howellia. There are also several Federal species of concern, including purple martin, Northwestern pond turtle, Northern red-legged frog, and black tern.

Bald eagles use Fern Ridge Lake year-round, foraging primarily on fish and waterfowl. Nesting was documented at the Jeans Peninsula nest site between 1982 and 1985; locals report the presence of breeding eagles in the area long before the dam was constructed. The Jeans nest was apparently abandoned in the mid-1980s, although a pair of eagles continued to use the perch trees near the nest site. This lead to assessment of the nest site as occupied, although nesting could never be confirmed. The year following the apparent abandonment of the Jeans nest, a new nest was established at Jones Swamp, 5 miles to the west, and in 1998 a new bald eagle nest was constructed north of the old Fern Ridge nest, but has yet to be successfully occupied. In 2003, adult eagles were again observed perching near the nest during the breeding season (Isaacs, 2003). In general, eagle observations at the reservoir are more common than in previous years. In 2003, bald eagles were frequently observed perching in the cottonwoods at the west end of the new Fisher Butte impoundments.

Oregon chub occurred historically in the Long Tom basin, but have not been relocated. No extant chub sites are known from the basin. Efforts are underway to create habitat at several locations

on the lower Long Tom River to establish new chub populations through transplanting (ODFW, unpubl. report).

Willamette spring chinook historically occurred in the Long Tom River. The Fern Ridge dam cut off most of this habitat, and channel work and human use has made the lower river too warm and turbid for salmonids. Juvenile spring chinook have been known to hold up in the mouth of the Long Tom during winter. Fish tend to congregate at river confluences, due to habitat diversity. Critical habitat has not been designated.

Fenders blue butterfly and Kincaid's lupine are present on uplands adjacent to the lake, outside the area affected by the proposed interim scenario. Golden Indian paintbrush is also associated with uplands but has not been located in the Willamette Valley for 50 years.

Bradshaw's lomatium and Willamette Valley Daisy are present on managed wet prairie adjacent to the lake. The wet prairie plant community that includes these species is thought to be dependent on a unique hydrology driven by a subsurface clay layer and precipitation. These communities are not expected to be affected by changes in the lake's hydrology.

Howellia (*Howellia aquatilis*) is an aquatic plant that grows in glacial ponds and oxbow sloughs. Once known throughout the northwest, the only reported site in Oregon was in Multnomah County. This species has never been located at Fern Ridge and is currently thought to be extirpated in Oregon.

Cultural Environment.

The Fern Ridge area has a long history of human use. Native Americans used the area heavily. The travel route used by early Euro-American explorers to access furs in the Umpqua Valley and northern California passed through now-inundated portions of the reservoir. Settlers located along the travel route, and eventually the area was converted to agriculture. Agriculture remains a prominent use of the area, although rural residential uses are displacing agrarian uses. Rural residential and recreation are the primary uses around the lake itself.

Recreation.

Fern Ridge Lake is a popular recreation area for a variety of water sports. Several park sites offer many day use recreation opportunities including picnicking, swimming, fishing and wildlife viewing. There are five developed public parks at Fern Ridge Lake, three with boat ramps and two also have marinas. There is also a Corps boat ramp at the West Abutment of the dam. This ramp is not up to current standards; however, it is the only ramp on the lake that accesses the minimum pool. There are also three privately-maintained marinas with ramps. (Fern Ridge Shores, Eugene Yacht Club and Tri-Pass Ski Club lease from the Corps; Tri-Pass Ski Club also has rights from Eugene Yacht Club.)

Recreational use, obtained via vehicle counts and estimates such as hunter permits, has varied over the past few years. There were about 790,000 visits to Fern Ridge during fiscal year (FY) 1999. Visitation dropped to about 500,800 visits in FY 2000. Recreational use declined considerably in FY 2001, to 313,300 visits, due to a drought that limited use of boat ramps. During FY 2002, visitation was back up to near the 2000 level at 498,300 visits. For FY 2003,

use was 592,907. Intake tower modification work at Cougar Reservoir, about 70 miles east of Eugene, may have shifted some use to Fern Ridge.

Recreational use is also sustained at various Project access points which include the Fern Ridge Wildlife Area. Public use of the wildlife management units is limited by management objectives: some waterfowl hunting and nonconsumptive uses such as bird watching are allowed as appropriate by ODFW. Land access to the wildlife units is limited to foot traffic and the distance from parking areas precludes most human use. Dense vegetative mat and lack of channels preclude access by boat during normal summer operations.

Fern Ridge Reservoir vehicle count data, compiled annually by the Corps, provides some indication as to how recreational activity is distributed. Vehicle count data are collected for the following different use areas surrounding Fern Ridge:

- Corps of Engineer parks and Lane County day use parks
- Fern Ridge Dam
- Private areas including marinas
- Oregon Department of Fish and Wildlife (ODFW) managed areas
- Remote access points surrounding reservoir
- Campground at Richardson Park

A review of the vehicle use data (1999 to 2003, excluding 2001 as it was an unusually dry year) demonstrates there is some variability in overall visitation totals but the relative distribution at each use area tends to remain reasonably constant. Vehicle data indicate the majority of use (62 percent to 67 percent of total) in any year occurs at the Corps and Lane County park sites. These sites are mixed use including fishing, picnicking, swimming and other water related activities. About 11 percent of visitation is centered at the ODFW managed areas for the purposes of wildlife viewing and hiking. Another 10 percent is focused at the private marina areas and is heavily geared to boating activities. About 8 percent of the visitation is related to Fern Ridge dam itself for fishing activities and the use of biking and jogging trails. Another 3 to 4 percent of visitation occurs through use of the remote access points to fish or observe wildlife. The remaining 2 to 4 percent of visitation is at the Lane County operated campground (Richardson Park) for which camping, boating, fishing and swimming are the major activities.

Recreation below the dam includes some fishing. Public access is limited. Visitation numbers are not available.

Socio-Economic.

The following information on the socio-economic resources of the area is drawn from the "2002 Regional Economic Profile" for Lane County, prepared by the Oregon Employment Department. The city of Eugene has the largest population in Lane County, Oregon. The history of Lane County typifies Oregon. Born of timber and agriculture, Lane County's economy has diversified into a regional center for the financial industry, higher education, and government. The county also boasts an active tourism industry. More recently, the manufacturing base has become more diverse with the emergence of internationally recognized high technology firms and the rapid expansion of the recreational vehicle manufacturing industry.

The State of Oregon and Lane County enjoyed an extended period of economic health during the decade of the 1990s. For the second half of the decade, unemployment rates hovered near record lows – just slightly higher than the national average. Employment growth slowed in 2000. The region experienced several layoffs and closures in all types of manufacturing, but particularly in high tech. Although slowing recently, employment growth has been among the fastest in the nation. Total personal income growth has been strong, registering 6 percent in the late 1990s.

Differences in regional comparative advantages played a large role in growth in the 1990s, particularly as related to the siting decisions of large multinationals. Favorable tax policies, combined with an abundance of lower cost water, land, and labor, created a very favorable environment for the relocation of large manufacturing facilities to Oregon. But these advantages are not as compelling as they once were. Tax incentives in many areas have been restricted. Home affordability (the Portland, Salem and Eugene metro areas are ranked among the least-affordable housing markets in the nation) and quality-of-life (commuting times and congestion) are also clearly not the attractions they were 10 years ago.

Oregon and Lane County have seen a substantial increase in their populations, with growth rates in excess of the national average. Estimates by the State data center at Portland State University indicate that in the 10 years between 1990 and 2000, Lane County's total population increased by 14.2 percent to reach 323,000 – an increase of over 40,000 persons.

The most recent population estimates indicate Lane County is the fourth most-populous county in Oregon and the third most-populous metropolitan statistical area after the Portland and Salem area. County residents are concentrated within a relatively small region around the Eugene/Springfield metropolitan area: fully 66 percent of the county's residents live in incorporated cities located within a 30-mile radius of Eugene and along Interstate 5.

There has been a definite slowing of the economy in recent times with unemployment data showing a deteriorating labor market. However, it is anticipated the local economy will improve as demand increased for goods and services in Lane.

Recreation. Visitation to Fern Ridge Lake over the last 3 years has averaged about 600,000 visitors per year. It has been estimated these recreation visitors spent over $8.5 million annually with a significant percentage of the visitor spending captured in the local economy. These sales generate millions of dollars in personal income and support hundreds of jobs.

Flood Control. The Fern Ridge project has prevented significant flood damages since its construction, by controlling the downstream flow of water during the flood season. The reduction of flood discharges along Long Tom River has resulted in cumulative flood control benefits of about $400 million dollars over the life of the project.

Irrigation. Information provided by the USBR indicates irrigated agriculture in Lane and Benton counties includes a large array of crops and farming types.

Annual rainfall in the area averages 46 inches, but only about 2.50 inches is in the June through August period, and 1.2 inches in the critical July to August period. Many crops like processing vegetables (sweet corn, beets, snap beans) and fresh marketed crops need supplemental water to mature and produce quality yields. In some cases the storage water is strictly insurance water to

ensure crop quality and yield. Vegetable processing crops are very sensitive to water supply during the critical flowering period. Without adequate water during this period yields can be reduced significantly. Therefore, irrigation has become common in the area for crops that require intensive capital investment.

1997 Census of Agriculture reports 2,830 farms in Lane and Benton counties. Thirty-two percent, or 910 farms, reported 43,701 irrigated acres. Total cropland harvested in the two counties was 154,389 acres; 28 percent is irrigated.

Crop income for the two counties, as reported by the Oregon Agriculture Information Network, Extension Economic Information Office, Oregon State University, was $157.9 million in 2001 and $158.3 million in 2002; equivalent to $1,131 per acre. Actual per acre values can range from $200 for grains and pasture, to $350 for hay and forage, to $450 for grass and legume seed, to $2,900 for tree fruits and nuts, and greater than $6,000 per acre for certain small fruit and berries and nursery and greenhouse products. The significance of specialty crop production can be demonstrated by the fact that with less than 1 percent of the acreage, specialty crops generate almost 27 percent of crop revenue.

In addition to $158.3 million in crop sales, livestock and livestock product sales generated $33.8 million in Benton and Lane counties in 2002. Dairy products accounted for 32.5 percent, cattle and calves 29 percent, and eggs and poultry with 23.1 percent.

Crop Revenues, Lands Irrigated with Fern Ridge Water. In the early 1950s an agreement between the Corps and the Bureau of Reclamation (USBR) established that the USBR would execute water service contracts with irrigators for the purposes of farming. A reliable source of irrigation water from Fern Ridge Reservoir has made it possible for farmers to grow higher-valued specialty crops and produce a greater diversity of crops in this region.

Currently, there are 59 contracts that receive water service from Fern Ridge Reservoir. These contracts provide for about 20,000 acre-feet of water annually for use on 9,900 acres of agricultural land (Lane=79 percent, Benton=21 percent). The majority of these lands are along the Long Tom River below the dam. Given that the USBR's annual water service rate is $8 per acre-foot, the total direct dollar value of the irrigation water used under these contracts ranges from $100,000 to $160,000. The major irrigated crops are processing vegetables (sweet corn, green beans), sugar beet seed, peppermint oil, grass seed, forages, and some specialty crops. The irrigated crops are combined in various rotations with non-irrigated crops.

Using representative cropping, irrigated yields, and prices received data, the crop revenue generated from the 9,900 acres was estimated at from $14.8 million to $18.8 million annually. Lands irrigated with Fern Ridge water are for the most part in the middle to upper range of crop intensity and revenue generating ability in the two-county area.

Using USDA farm income data, Agricultural Census data, and correlation analysis with other irrigated areas, the net farm income for the 9,900 acres is estimated to range from $1.48 million to $2.9 million annually. The midpoint value is $2.26 million annually.

It is clear the value of the irrigation water to the regional economy is significantly higher than the value of water delivery contracts, because it allows for the production of higher valued commodities and supports more seasonal and year-round jobs.

Other Irrigation. As of 2003, there are about a dozen adjacent property owners who have legitimate water use permits and/or related facility permits to remove stored water from Fern Ridge Lake. Some of these authorized users have pumping facilities on Project Lands while several others have surface draft tubes and/or facilities appurtenant to boat moorage structures. Several users access stored water from off-Project backwater sites such as the Amazon Creek Diversion east of the Project boundary, Innman Creek west of the Project boundary, and Coyote Creek south of the Project Boundary.

Cultural Resources.

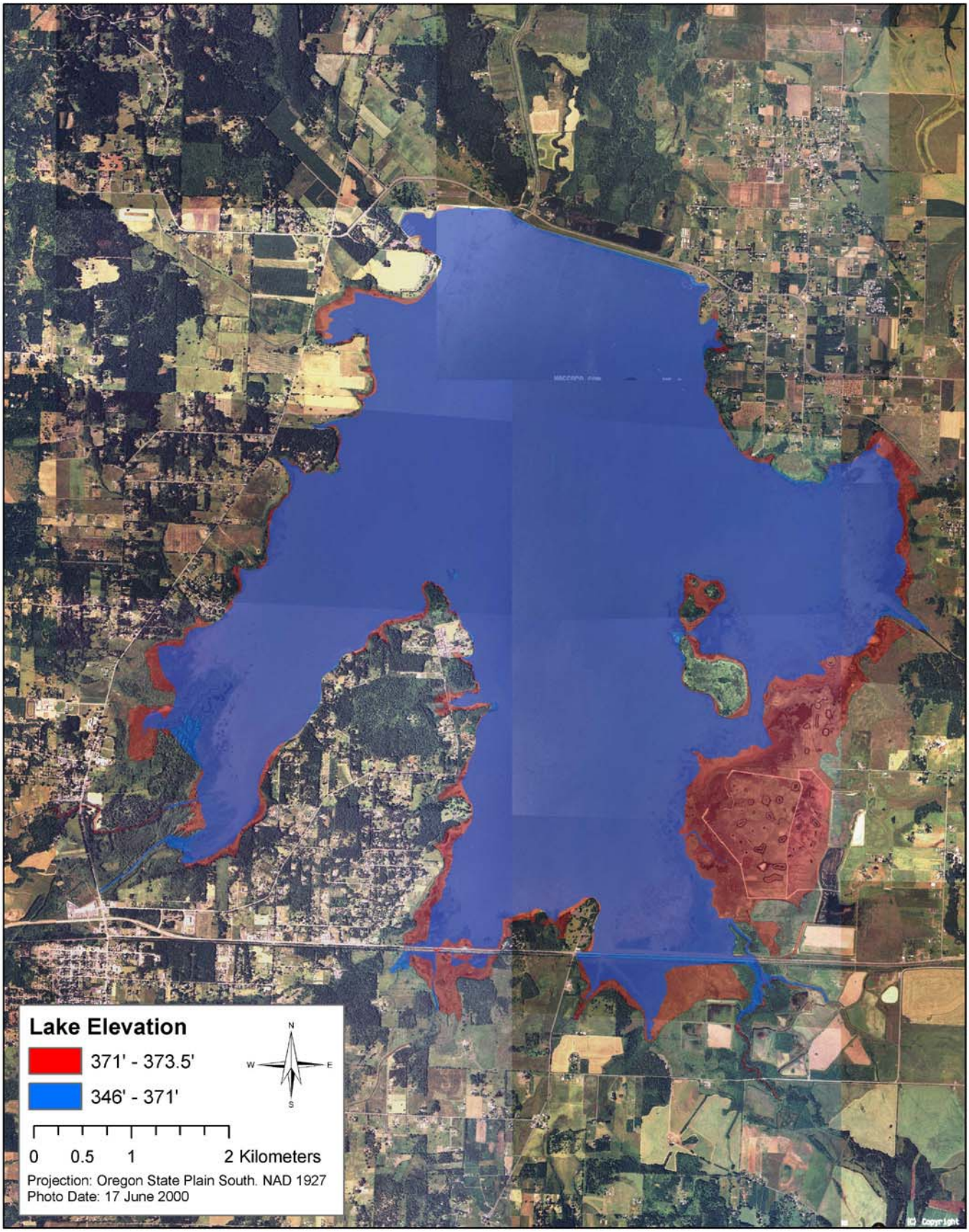
A number of cultural resource surveys and archeological excavations have occurred within the Fern Ridge Project. The project area was visited by members of the River Basin Surveys prior to 1930 (Strong, Schenck, Steward 1930). Field crews from the University of Oregon surveyed the eastern shoreline (Minor 1978) and the rest of the project in the mid-1980s (Cheatham 1984; 1988). The 1980's work included archeological excavations to evaluate site areas and determine site significance. In addition to this work, the Long Tom drainage was surveyed (Toepel 1985a) and the lower reaches of Amazon Creek (Oetting 1995). The results of these studies indicate a high archeological site density along Long Tom and Coyote Creek within the project area. Site densities substantially decrease downstream and upstream of the project, although Long Tom Creek continues to be an area where archeological sites can be expected.

ENVIRONMENTAL EFFECTS

Effects on Physical Environment. During winter, about 2,865 acres of lakebed would not be inundated for flood control. While this area is normally only occasionally inundated during floods, under interim operation it would not be inundated at all and the lakebed would be exposed to the elements for the interim operation years. Some erosion of the exposed lakebed by winter rains is likely, with concomitant increases in turbidity in the lake. Most of this maximum flood control pool is vegetated, thus erosion would be minor. During summer, the pool would be held at or near 371 feet, and about 1,450 acres of lakebed normally inundated during the spring through fall period would be exposed. (Figure 2) Impounded water would likely be somewhat warmer in the summer than during normal operation. Water depth during the summer would be reduced 1.5 to 2.5 feet from normal, depending on whether the pool could be raised above 371 feet.

Although the wetland impoundments are filled in winter by surface water, many of the wetland impoundments are artificially filled in the fall by pumping from the lake prior to drawdown. This provides additional wetland habitat for migrating birds, and ensures that the ponds will be full by waterfowl hunting season. Early filling is also a critical component of reed canarygrass conversion efforts in the new Fisher Butte impoundments. The proposed actions should have no effect on this operation, because pumping facilities are available until the lake drops below elevation 364 feet NGVD. A new pipeline was added in 2003 to facilitate pumping to the new impoundments during low water situations.

Figure 2: Inundation Area at 371'



The flood regulation goal at Monroe is 4, 560 cfs. With full flood control storage available, the probability of this flow is being equaled or exceeded, on an annual basis, is about 85 - 90 percent. Major flood flow is set at 7,000 cfs; this has an annual probability of being equaled or exceeded of about 30 percent. The reduction in available flood storage at Fern Ridge Lake could have a range of downstream effects. Under a relatively benign flooding scenario only slightly higher flood flows might be expected. These would be contained within the flood regulation goal or the bankfull flow target. These slightly higher than usual flood flows are not expected to cause unusual erosion of the Long Tom channel, or have any other measurable effect. During the major flood season, 16 November through 31 January, it is unlikely that Fern Ridge Lake would be able to fully control roughly a 20 percent inflow. This compares to being able to fully control a 5 to 10 percent flood with full storage available.

The downstream effect of the lake flood storage reduction would depend on circumstances surrounding the particular flood(s) that might occur. For example, a relatively large flood (one that *may* have used the missing storage) would be controlled to lesser degree without the storage availability. However, drafting of the lake under this scenario would occur more quickly. So in this example, peak flows downstream might be higher, but erosion (caused by duration of high flows) might be less.

Effects on Biological Environment. Several concerns about impacts to natural resources from interim operation have been evaluated. These are detailed below, and summarized in Table 2.

Vegetation/Habitat. Reed canarygrass is expected to expand its range to lower elevations of the lake as a result of the proposed action. Maintaining the water level at 371 feet NGVD instead of 373.5 feet NGVD through two or more full growing seasons will likely promote canarygrass growth at lower elevations. Expansion was observed after the severe drought of 2001 in several locations around the lake. Some of the newly grown grass survived despite normal operations in 2002; it is thought that canarygrass can survive if established at elevations where it isn't able to establish under normal conditions. Expansion of canarygrass into native aquatic plant beds is undesirable, and may cause problems for boat access to some areas.

The proposed action will reduce the acreage of emergent marsh flooded at conservation pool by approximately 975 acres. This impact will be most noticeable in the southeastern part of the lake (South Marsh, Fisher Butte and Royal Amazon management Units). Canarygrass marsh that grows most vigorously at the higher elevations will be more affected than bulrush, which grows closer to the 370 – 371 foot contour. Hundreds of acres of canarygrass, cattail and bulrush marsh will still be inundated, particularly in the southwestern part of the lake near the Long Tom river channel. Reduction in flooded marsh acreage will reduce habitat available for species that breed, forage and raise their young in the marsh, including waterfowl, wading birds, bats, western pond turtles, frogs and salamanders.

With exposed lakebed, illegal ORV use is expected to increase. Such use tends to cause habitat damage and wildlife harassment. Staff monitoring is expected to keep such impacts to a minimum.

Impoundments. Wetland impoundments within Fern Ridge Wildlife Area will continue to provide breeding, brood and forage habitat for a myriad of species. Several hundred acres of impoundments are expected to fill normally during the winter from surface runoff and

Table 2 Summary of Impacts

Resource	Impact	Management Action
Wildlife	Temporary loss of habitat. Harassment by ORV use in exposed lakebed.	Increase staff monitoring for illegal ORV use
Waterfowl	Temporary loss of habitat. Loss of eggs possible if pool exceeds 371 feet after 5/1.	Flood impoundments. Pump water into wildlife impoundments.
Black tern	Temporary loss of foraging habitat, some nests at risk of flooding after 5/1.	Optimize wetland impoundments instead of food crops
Purple martin	Some nest boxes not protected from predators due to exposed lakebed.	Install predator guards. Monitor.
Pond turtle	Temporary loss of habitat (975 acres emergent veg.), increased predation due to lack of cover.	Optimize wetland impoundments
Red-legged frog	Temporary loss of habitat for tadpoles; concentration of tadpoles and predators.	Optimize wetland impoundments
Fish	Possible temporary reduction in productivity in smaller pool. Open water area reduced by about 150 acres, shallow water habitat reduced by 975 acres.	
Bald eagle	Improved foraging success initially; slight reduction in foraging success if fish productivity declines.	
Vegetation	Expansion of reed canarygrass at pool margins.	Spot treatment to remove grass.
Recreation	About 13 percent reduction in recreation use. Pool too shallow for deep-keeled sailboat moorage . Some transfer of activities to other sites.	
Irrigation	No effect anticipated to users along the Long Tom below the dam. Users above the dam may lose access to water or need to extend supply pipes.	
Flood control	Reduced lake capacity will reduce ability to contain large floods. Time to draft a smaller pool following a major flood would be shortened.	Early warning system in effect.
Economics	Some economic loss due to reduction in recreation, specifically sail boating. With 13 percent reduction, visitor expenditures reduced $1.1 million/year.	
Cultural	Potential for illegal removal of cultural artifacts.	Increased monitoring

supplemental pumping. Without pumping, the new Fisher Butte impoundments (Field 5&6) experience faster than normal decline in water levels due to decreased lake elevation; other impoundments shouldn't be affected. Management of the new impoundments calls for extended flooding during the growing season to suppress growth of canarygrass after disking; additional flooding capability was constructed in 2003 to achieve this. As a result, the canarygrass conversion program should not be compromised by the reduced water levels in the lake.

Birds. One proposed scenario calls for increasing water levels in May, after filling and holding the pool at 371 feet NGVD to evaluate the dam's integrity. Most marsh breeding birds and waterfowl return to their breeding areas in late April or early May, and some will have started nests and laid eggs while the pool is stable in late April and early May. In a normal weather year, the proposed scenario is expected to increase the lake's elevation by approximately 6 inches after May 1st, flooding an additional 100–150 acres; an unusually wet May could flood more acreage, putting more nests at risk. Teal and mallard may be less vulnerable and more successful at finding suitable re-nesting sites because they will nest in transitional uplands and terrestrial locations. Ruddy duck and redhead nest over water and would potentially be more vulnerable.

Grebes, rails and terns, and some shorebirds are potentially vulnerable to rising water levels because they often nest above shallow water, anchoring their nests to growing rooted vegetation. As the water rises, nests and eggs can be flooded and destroyed. Flooding is of particular concern with respect to impacts to declining species (American bittern, black tern), and the unusual breeding species, including black-necked stilt, Clark's grebe, Wilson's phalarope, Wilson's snipe, redhead, and ruddy duck. Black terns, both an unusual breeding species west of the Cascades and a species of concern, returns relatively late to its breeding grounds and is not expected to be affected by rising water levels to the same extent as birds that nest earlier.

Total marsh acreage at Fern Ridge providing suitable breeding habitat for one or more wading bird or waterfowl species below the lake's normal full-pool elevation (373.5 feet NGVD) is estimated at approximately 2,500 acres. Stable water levels will be available in the 320-acre Fisher Butte impoundments that will be managed to provide flooded marsh during the interim years. Impoundments in the west and east Coyote units will provide an additional 250–300 acres of stable breeding habitat. Although canarygrass conversion efforts since 2002 have reduced the nesting cover available in the Fisher Butte impoundments, they will still provide cover and nesting habitat for breeding birds around the potholes and in other areas that could not be disked.

Implementation of the proposed scenario will alter the location of available shorebird habitat during fall migration. Exposed mudflats will be lower in the lakebed than in a normal year, and more distant from shore. Shorebird use of the wetland impoundments may be altered due to earlier drying; mudflats may be available earlier than normal. This may actually benefit shorebirds by providing habitat earlier in August when migrating birds begin to arrive.

Black terns usually return to the same wetland, but not to the same site. They seem to be adapted to changing conditions typical of natural marsh habitats (Neuman and Blokpoel, 1997).

The interim water level management proposed for Fern Ridge Lake may put some black tern nests at risk for flooding. In general, black terns may be at less risk than many marsh bird species that typically nest earlier. Nest initiation does not occur until the third week in May – by that time the lake is unlikely to fill much more. Terns are somewhat adapted to instability in their breeding habitat, show relatively low site fidelity, and readily re-nest, all characteristics that should reduce the impact of the proposed action on black terns. Like all marsh dependent species at Fern Ridge, black terns will be affected by the reduction in flooded marsh habitat that provides foraging resources for adults and broods.

Turtles. Pond turtles living in Fern Ridge Lake will be affected by controlling water levels according to the proposed interim scenario. Radio-telemetry at Fern Ridge and other Corps'

lakes indicates that turtles spend the vast majority of their time near-shore, where cover and forage resources are also found (Corps, unpubl. data). Reed canarygrass and other emergent vegetation provide cover, and support invertebrate communities that provide forage for turtles. The interim scenario will result in the short-term loss of approximately 950 acres of flooded wetland vegetation potentially available to turtles for life-functions. Because turtles probably use the water/canary grass interface more than they use the upper elevations of extensive canarygrass marshes, the actual number of acres lost may be functionally less. The distance between aquatic habitats and upland nesting sites will be increased, requiring female turtles to expend more energy and endure increased vulnerability to predation as they travel overland to traditional nesting sites. Invertebrate food supplies may decrease, negatively affecting pond turtles. Radio-telemetry indicates that turtles near the old Long Tom over-winter in the canarygrass marsh, but over-winter locations of turtles residing elsewhere on the lake are unknown, and probably include terrestrial locations. Since turtles typically don't begin to travel to over-winter sites until the latter half of October, when the lake will be more or less at normal water levels, the interim scenario should have no impact on turtles traveling to over-winter locations.

Long-term effects of the interim scenario on turtles are not known. Turtles may benefit from the increased presence of canarygrass at lower elevations that is expected to result from implementation of the scenario. Overall impacts are expected to be negative, based on short-term habitat loss, decreased food resources, and increased predation risk traveling to nesting sites. If the pool is raised after May 1st, impacts resulting from habitat loss and increased distance to nest sites may be slightly reduced.

The interim scenario will not affect the Kirk Pond turtle population. Flows to lower Coyote Creek will remain approximately the same, and pond water levels will not be altered. Kirk Pond turtles are expected to over-winter primarily in the pond, and will not be affected.

Frogs. Adult red-legged frogs breeding at the Frog Pond area at Fern Ridge should experience normal breeding conditions at the site because the proposed scenario will not impact winter water levels in an average year. Hatching should proceed as in a typical year, but the scenario will alter the environment for tadpoles prior to metamorphosis, beginning about the third week in March, when water would normally begin to inundate the ponds. Instead of being flooded by 1–3 feet of water in April – June, water levels will remain only slightly above winter levels. This will decrease the habitat available to tadpoles, and may concentrate both tadpoles and their predators. Temperatures will increase relative to a typical year, which may hasten metamorphosis. In the drought year of 2001, a similar condition existed in that the lake did not fill or flood the ponds. Red-legged breeding still occurred, but was the lowest in the 7 years this site has been monitored, although this was more likely to be a result of the very dry winter. Without the lake to flood it, the ponds will probably dry down earlier in the summer, and it is likely that Half Moon pond will dry up. Froglets should have moved to riparian habitats by then, and drying conditions may have a negative impact to bullfrog tadpoles, that need 2 years to metamorphose, and perhaps more importantly to exotic fish that prey on frogs (Adams, et al. 2003).

Fish. The interim water level management proposed for Fern Ridge Lake will cause an unquantifiable reduction in the fish production capability of the reservoir because of the loss of 950 acres of shallow water spawning habitat and 150 acres of open water habitat for fish. Reduced reservoir levels may affect warmwater gamefish production and spawning short term within the reservoir; however, cutthroat trout residing in the reservoir should not be significantly

affected. Fish, including Pacific lamprey and cutthroat trout, inhabiting the Long Tom downstream of Fern Ridge Reservoir, should experience normal flow and water temperature conditions and thus no impacts are anticipated.

Effects on Threatened and Endangered Species. The proposed interim water level management scenario will reduce the surface area of the lake by approximately 1,500 acres during the latter part of the bald eagle breeding season (May – July) when eagles are feeding young in the nest. Fish may be slightly more concentrated and easier to capture as a result of decreased lake volume. However, warmwater fish species production may decrease as a result of reduced marsh flooding, reducing fish density after the first year. The impoundments will provide wetland habitat during the interim scenario, although they may dry down earlier than normal, and should continue to provide some foraging opportunity for eagles. During the winter, the wetland impoundments and lake levels will be more or less unaffected during the interim scenario, and will continue to provide habitat for wintering waterfowl and forage for eagles.

Wintering eagles will not be affected by the proposed action. Breeding bald eagles may alter their use of foraging perches in response to lower lake levels; this impact is not expected to result in adverse effect.

The major impact of the lake on adjacent wet prairie is thought to be the spread of undesirable invasive reed canarygrass from the lake into wetter portions of the prairie from the lake's margins. As a result of failing to fill the lake for at least 2 years, the interim scenario may weaken reed-canary grass growing near the lake/prairie interface, and create an opportunity for increased effectiveness of control measures.

The proposed interim scenario will not affect biota, including the Long Tom ACEC plant community, below the dam. Fish inhabiting the Long Tom downstream of Fern Ridge Reservoir should experience normal flow and water temperature conditions and thus no impacts are anticipated. Willamette spring chinook juveniles, holding in the mouth of the Long Tom, would not be affected.

Effects on Cultural Environment.

Recreation. Recreational use is the primary cultural element to be affected by interim operation. Sail boaters would be most affected. Existing boat ramps have toe elevations ranging from elevation 361' to 368'. None of the boat ramps would be unusable for shallow draft boats, but ramps and marina slips may have inadequate depth for deep-keel vessels by late summer. The drought condition experienced in year 2001 resulted in the reservoir pool filling to only 365.8 feet and demonstrates how very low summer water levels in the reservoir impact recreation activities. Overall visitation in 2001 was about half what has typically been experienced over the last few years. Visitation of the Corps and Lane County day use parks, Fern Ridge dam and the private marina use areas dropped by over 65 percent. Whereas, ODFW managed area visitation was down about 50 percent, remote access points down about 5 percent and Richardson Park Campground down about 15 percent. The distribution of the reduced visitation indicates the low water conditions severely impacted boating activities.

Under interim dam operation conditions it is anticipated the pool level would not drop to the very low levels of 2001. Interim dam operations will result in the pool to be filled to about 371 feet at

the start of summer, and could decrease another 2 to 3 feet by late summer due to evaporation and outflows. All boat ramps would remain useable most of the summer for shallow bottom craft. Low keel clearance and shoreline exposure could lead some recreationists to seek other types of recreation or recreate elsewhere. These conditions will likely result in some impacts to boat recreation users, but will be significantly less in comparison to year 2001 conditions.

Historical recreation use data for the mid-1980s provides an indication of how lower lake levels during the interim operations will impact use. Fern Ridge reservoir was only filled to elevation 371.2 feet in 1987, about the same elevation expected at the beginning of summer under interim operations. Comparing 1987 recreation visitation to 1986 and 1988 visitation shows recreation use dropped about 100,000 visits or 13 percent in 1987.

While lake levels during interim operations would not exceed 371 feet and could decrease another 2 to 3 feet by late summer due to evaporation and outflows, levels would not drop to the very low levels of 2001 (unless there was a severe drought or an emergency situation occurred). All boat ramps would remain useable most of the summer for shallow bottom craft. Low keel clearance and shoreline exposure could lead some recreationists to seek other types of recreation or recreate elsewhere.

It is anticipated that the lower reservoir level will primarily impact boat recreation use and not significantly impact other recreation activities. Interviews with marina operators support the conclusion that boat recreation, opportunities will be available with reservoir elevations at 371 feet but some activities, particularly sail boating, will be significantly impacted as the season progresses. Although variable by marina and types of boat, marina operators indicated water surface elevation at or below 370 feet would limit the use of some of the boat slips. A major reduction in boat slip usage would likely be experienced towards the later part of the summer because reservoir levels naturally drop a few feet by the end of the season. Limited impacts to the boat users at the beginning of the season are anticipated. However, by the middle of summer it is likely that reduced boat slip usage under lower water conditions will severely reduce sailboat activity.

Although boat recreation is an important use of Fern Ridge, many other types of recreation activity takes place. Visitation data from the mid-1980s supports the conclusion that the overall level of visitation to Fern Ridge reservoir would drop about 13 percent under interim operation conditions. This could result in about $1.1 million reduction in visitor spending in the region.

Irrigation. Irrigation from stored water downstream of the dam is not expected to be affected during interim operation. The proposed interim operation plan will most probably negatively impact a couple of water users above the dam. The lower pool level will preclude any stored water from being backed up Amazon Creek channel or backwater ditches. Interim measures to install temporary pumps to access the water may be considered, however, or water from wells might be used. Subsequent reseeding of playing fields may be necessary. Most of the remaining users will experience some difficulty, and may have some additional expense to reconfigure their pump systems; however, they should be able to access the anticipated lower water level. For most of the small volume users with 2-inch suction lines it will not be difficult to adapt to the lower pool.Impacts would be similar to other low water years.

Flood Control. Flood control capacity would be reduced by about 30 percent. No storage of inflow would occur above the pool limit of 371 feet. Additional downstream flooding could occur under a large flood condition. Flood flows at Monroe are about 7,000 cfs. It is possible the duration of high flows might be reduced downstream due to less stored water to be released following a large inflow.

Effects on Cultural Resources

Project staff patrols the Fern Ridge Project area. While vandalism of archeological sites is an issue during any lower pool event (such as the 2001 drought), the areas typically exposed are places where emergent vegetation grows. This is the zone between seasonally permanent watered areas and pool fluctuation. This area is sufficiently vegetated that cultural resources are not generally exposed by small pool fluctuations. Of the exposed lakebed between 371 feet and 373.5 feet most, 1,293 acres, would be vegetated. However, about 150 acres would be bare.

There may be temporary increased flows during the flood season along the reach of Long Tom Creek below Fern Ridge Dam. Much of Long Tom Creek has been channelized and the creek's stream banks armored with stone. It is unlikely that small increased flows over short periods of time will expose or erode cultural resources given previous channelization and armoring of the stream banks.
Dr. Tom Connolly, Research Director, State Museum of Anthropology, University of Oregon, submitted an e-mail to the Corps, stating that he believes lowering the pool to below its normal minimum and holding the pool at this elevation through the summer may encourage vandalism of site areas previous not exposed. Dr. Connolly's concern has been provided to the Project Manager for this work, as well as to Fern Ridge Project Management Staff. If, in the future, a rehabilitation effort is funded that substantially changes the normal operation of the reservoir, or emergency drawdown occurs, a detailed plan to protect cultural resources will be developed. This will include increase public contact, but may also include ground surveys to verify the locations of cultural resources documented in the minimum pool and a strategy to evaluate these resources.

Mitigation.

Some measures to mitigate for wildlife habitat and other potential natural resource losses are proposed. These include "conservation measures" to reduce affects on Federal species of concerns. Table 2 includes the proposed measures. Improving water supply to existing wildlife impoundments in Fisher Butte Wildlife Management Unit was implemented in the fall of 2003, because the existing water supply system was inadequate when the pool level is lower than normal. While this action was needed for drought years, it also will assist during the dam repair activities. (USACE, Amendment of NEPA and Section 404 Coverage for Fern Ridge Marsh Restoration. Sept. 4, 2003.)

Significance.

Loss of wildlife habitat due to interim operation would be temporary. Similar losses occur during normal climatic cycles, such as the drought in 1987 and the severe 2001, which reduced lake levels several feet lower than that proposed in the interim operation. Habitat is expected to return to pre-interim operation conditions. Loss of habitat due to invasion of reed canarygrass would be

partially mitigated by spot treatment to eradicate new growth. Maintaining the wildlife impoundments would also reduce the impact of habitat loss. Loss of marshbird nests could cause a short-term decline in certain species numbers; however, this is also a temporary effect, with bird numbers expected to return to normal within a few years. Mitigation for purple martin (nest box protection) and black tern (wildlife impoundment management) will reduce loss for these species of concern. Some species will recover more quickly than others. Overall, this is not expected to be a significant impact.

Long-term effect on northwestern pond turtles is unknown. This is cause for concern, since this species has suffered a range-wide reduction in numbers. Pond turtles have suffered from a combination of impacts, primarily from the loss of habitat. Effects of this loss are compounded by the introduction of exotic hatchling predators such as bullfrog and large-mouth bass. The lower pool of interim operation is not expected to significantly affect the turtle.

Other than wildlife, the primary impact of the interim operation is on recreation and economic losses due to a reduction in recreation. It is expected that conditions would be similar to those of the drought in 1987, when recreation use at Fern Ridge dropped 13 percent. The shortened boating season, particularly sail boating, would directly impact the revenues received by the marina operators and other suppliers, but would have limited impact on the overall regional economy.

It has been estimated a 13 percent reduction in recreation use at Fern Ridge reservoir would result in about $1.1 million reduction in visitor spending in the region. While this may cause temporary hardship for some of the local businesses and residents, it is not regionally or nationally significant. The 2002 Oregon Employment Department Regional Economic Profile indicates that Lane County had a 2000 population of 323,950 people, with a per capita income of $25,584, resulting in total income of $8.3 billion dollars in the regional economy.

While irrigators on the Long Tom River below the dam would likely be unaffected by the interim operation, several irrigators above or adjacent to the reservoir would either lose access to stored water or need to extend supply pipes to reach the lower water level. Few users would be affected; on a regional scale this is not considered significant.

Cumulative Impacts.

Cougar Reservoir would still be drawn down to construction pool with no water recreation until summer 2005, and would be unavailable for transfer recreation until that time. Cumulatively, there would be less reservoir recreation available until summer 2005. If interim years are dry, other reservoirs may have to be drawn down early to provide minimum flows for the Willamette River at Albany. Conditions at other Corps reservoirs could be slightly more crowded and some recreationists would make different recreation choices.

COORDINATION

Since discovering the safety situation at Fern Ridge dam, the Corps has held four local public meetings and established a web site to keep the public informed. The Environmental Assessment will be issued for 30-day public review. The document will be provided to Federal and State

agencies as well as various property owners and interested publics. Agencies the document is been sent to include:

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Oregon State Historic Preservation Office
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of Water Resources
Oregon Parks and Recreation Department
Lane Council of Governments
Lane County Commissioners
Lane County Parks Department
Watermaster
Local Publics

CONSULTATION REQUIREMENTS

a. Clean Air Act of 1970, as amended: The proposed action would not affect the Eugene/Springfield airshed.

b. Clean Water Act of 1977 (33 U.S.C. 1344): The proposed action is not likely to result in the placement of material in waters of the United States. Repair and maintenance of an existing serviceable structure is exempt under Section 404 (f). A Section 404 (1)(b) Evaluation is not required. A previous State water quality certification, for fill related to restoration activities in West Coyote Management Unit, was received dated June 21, 1996, and is still in effect.

c. Coastal Zone Management Act: The project site is not within the coastal zone, therefore the provisions of this act do not apply.

d. Endangered Species Act of 1973, as amended: No threatened or endangered species or their habitat would be adversely affected by the proposed action. A biological assessment for these Federally-listed species has been prepared, with a determination of may affect, not likely to adversely affect bald eagles, and no effect on all other listed species. This determination has been provided to the U.S. Fish and Wildlife Service (USFWS).

e. Fish and Wildlife Coordination Act: The proposed action has been coordinated with the U.S. Fish and Wildlife Service, NMFS and ODFW in accordance with the Act.

f. Marine Protection, Research, and Sanctuaries Act of 1972, as amended: No marine resources would be affected by the proposed action.

g. Cultural Resources Acts: A no effect determination on cultural resources will be coordinated with the Oregon State Historic Preservation Office (SHPO).

h. Executive Order 11988, Flood Plain Management, 24 May 1977: The proposed action could have a short-term effect on flood plains if discharge exceeds downstream bank capacity.

i. Executive Order 11990, Protection of Wetlands: The proposed action would have a temporary adverse effect on wetlands.

j. Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. The proposed action would likely have a minor negative effect on migratory birds due to temporary habitat loss and the possibility of flooded nests. This effect is not measurable. Any loss of eggs would be incidental to the project, and not a project purpose. An environmental analysis, with emphasis on species of concern, has been provided in this EA.

k. Analysis of Impacts on Prime and Unique Farmlands: No change in prime and unique farmlands would occur.

l. Migratory Bird Treaty Act of 1918, as amended. This act prohibits the taking of migratory birds except as permitted through certain regulations. These regulations (50 CFR 21) authorize the taking of migratory birds through establishment of hunting seasons and issuance of various permits. Permits may be issued for "depredation control purposes," including reducing damage to public property. Permits may be issued to wildlife management authorities for the purpose of protecting State and Federal listed plants or animals, or species of management concern from predation or competition at levels documented to jeopardize the recovery of stability of such species. Permits are not required to scare or herd depredating migratory birds, unless such actions result in the abandonment of active nests, or the loss of eggs, nestlings or adults. Any loss of eggs due to the proposed action would be incidental, and not a project purpose.

The United States Government continues to be bound by the international agreements (four bilateral Migratory Bird Conventions) to protect migratory birds. The USFWS continues to informally consult with other Federal agencies, to ensure those agencies conduct Federal actions in a manner that complies with the obligations of the Government under the various Migratory Bird Conventions.

m. Comprehensive and Environmental Response, Compensation and Liability Act (CERCLA). The location of the proposed project is not within the boundaries of a site designated by the EPA or a State for a response action under CERCLA, nor is it a part of a National Priority List site under CERCLA. Should any HTRW material be discovered during construction, its presence will be responded to within the requirements of the law and USACE regulations and guidance.

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